Fermilab U.S. DEPARTMENT OF ENERGY Office of Science

GEM Project: Developing A Graphical User Interface for DUNE HEPCloud

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GEM Project Presentation

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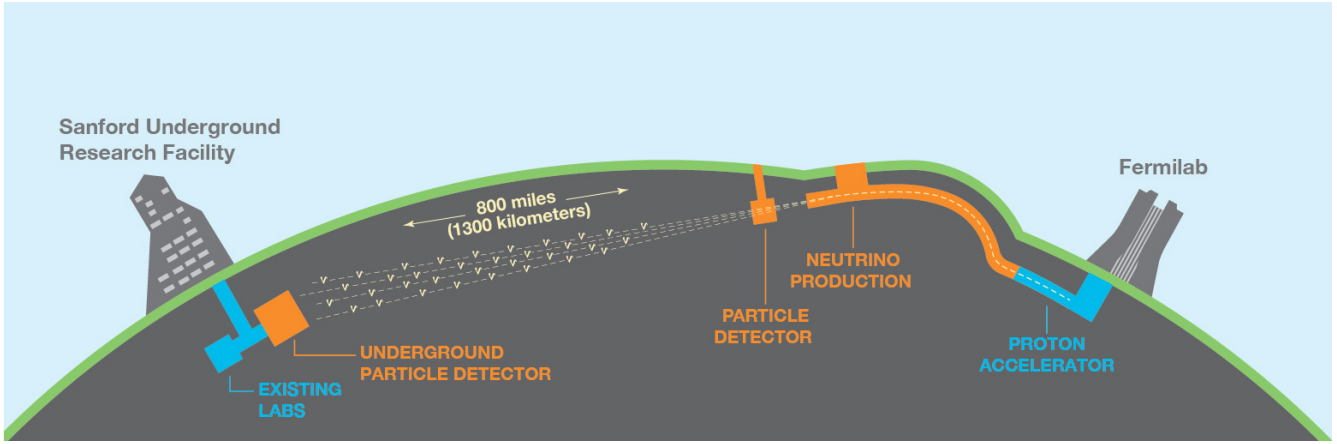
A Brief Introduction to DUNE

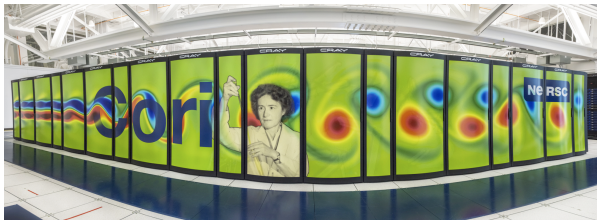
- **Deep Underground Neutrino Experiment**
- Under-construction accelerator and neutrino detectors that analyze long-baseline neutrino oscillations.
- Observing neutrino flavor oscillation patterns in conjunction with environment variables.
- Insight into origin of matter, antimatter and, ultimately, the universe.



Technology @ DUNE

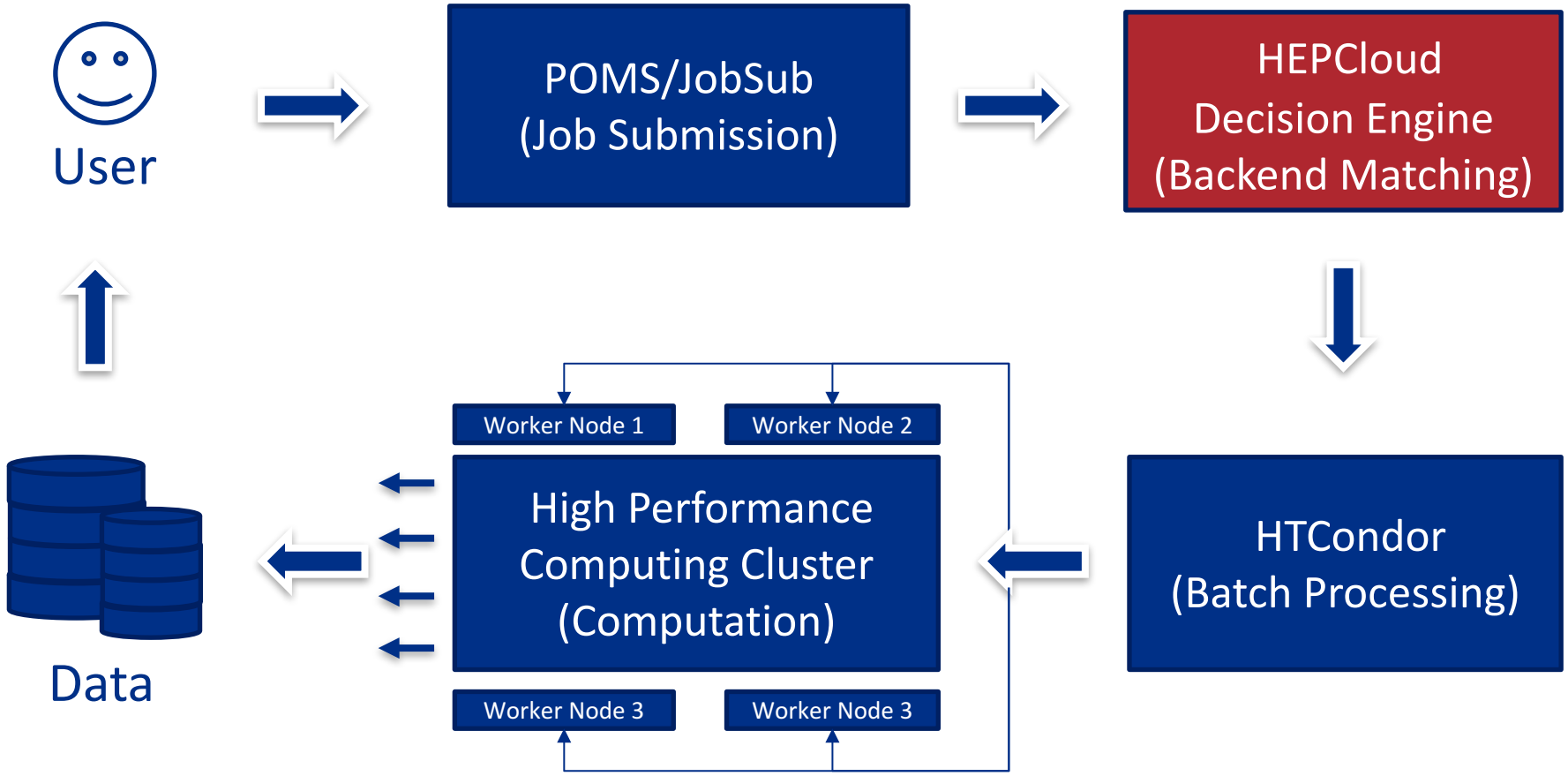
- Operations at DUNE are **algorithmically complex**
  - Computation jobs require hundreds of millions of CPU hours
  - Need for high performance computing (HPC)
- **HEPCloud**
  - Gateway for a wide-range of computing resources
    - Ex: supercomputers, institutional clusters, commercial clouds.
  - Hosts the HEPCloud Decision Engine.
  - Looks at job data/parameters to decide which cluster is most appropriate to run user-submitted jobs.

Aurora @ Argonne National Lab



Cori @ National Berkeley Lab

A Quick Look into DUNE User Workflow



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Decision Engine – A Closer Look

- HEPCloud Decision Engine is largely a **black box** for users.
  - No power to modify parameters for job submission and global system.
  - No transparency for backend-matching decisions being made internally.
- Potential for misallocated resources
  - Financial: Paying $0.0001 for Google Cloud Platform vs. $0.0002 for Amazon Compute Cloud.
  - Computational: Waiting on occupied nodes at X when there are available nodes at Y.
- Lack of user confidence and awareness

Objective

- Build a user interface that DUNE users can use to
  - Read and Write the global state of the Decision Engine.
  - Read and Write job-specific parameters.
  - Read Decision Engine data regarding cluster backend-matching.
- Increased system transparency
- Increased user control over job parameters.
- Easy-to-use user interface (UI) that eliminates learning curves while maintaining overall system integrity.